Specialist High Skills Major

Sector-Specific Guide

Mining

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A. Overview

The Specialist High Skills Majors (SHSM), launched in September 2006, are part of the Student Success Strategy initiative, which focuses on expanding quality learning opportunities and supporting success for all students. The SHSM is a ministry-approved specialized program that allows students to focus their learning on a specific economic sector while meeting the requirements for the Ontario Secondary School Diploma (OSSD). This career-focused program is also designed to help prepare students to make the transition from secondary school to apprenticeship training, college, university, or the workplace. An SHSM enables students to gain sector-specific skills and knowledge in the context of engaging, career-related learning environments and helps them focus on graduation and on pursuing their postsecondary goals.

The ministry has published the *Specialist High Skills Major Implementation Guide*, as well as sector-specific guides, like this one, for each of the SHSM economic sectors. Boards and schools are strongly encouraged to refer to the *SHSM Implementation Guide* along with the SHSM sector-specific guides when planning and implementing an SHSM.

This guide provides information about the five required components of the SHSM–Mining, sample pathways for the SHSM, examples of postsecondary programs in the sector, a list of resources, and profiles of the programs that were being offered in Ontario schools in 2007–08.

B. Advantages of Earning a Specialist High Skills Major (SHSM) in Mining

According to the Mining Industry Human Resources Council,* over the next ten years there will be a shortage of 92 000 workers in the mining and minerals sector. The shortage will be especially critical in the following occupations: physical scientists, engineers, technicians/technologists, skilled trades, mine labourers, and support staff. The anticipated demand is a result of industry growth, retirements (especially in the skilled trades), competition for labour from other economic sectors, and the challenges of recruiting young people into mining occupations. Jobs in the industry offer competitive wages, benefits, and advancement opportunities.

The SHSM–Mining enables students to build a foundation of sector-focused knowledge and skills before graduating and entering a postsecondary destination, whether it be apprenticeship training, college, university, or an entry-level position in the workplace.

Pursuing the Specialist High Skills Major–Mining enables students to:

- customize their secondary school education to suit their interests and talents while meeting the requirements for the OSSD;
- select a bundle of 9 required credits focused on sector-specific knowledge and skills that are:
  - valued by the mining sector and postsecondary educational institutions;
  - designed to help prepare students for a postsecondary destination of their choice in this economic sector;
  - designed with the flexibility to allow students to shift between pathways (e.g., switch from a pathway leading to college to an apprenticeship pathway) or to discontinue the SHSM program should their career plans change in Grade 11 or 12;
- provide evidence of achievement of the required components of the SHSM (e.g., sector-recognized certifications) for prospective employers and postsecondary educational institutions;
- explore, identify, and refine career goals and make informed decisions about their postsecondary options;
- take part in "reach ahead" that will help them gain confidence in their ability to be successful, refine skills and work habits, and make an informed choice about future careers and next steps;

* From the Council's website, at www.mihr.ca. Retrieved February 2007.

- develop Essential Skills and work habits that are required in the sector, and have their performance of those skills and work habits assessed and documented, using tools connected with the Ontario Skills Passport;
- access resources, equipment, and expertise that may not be available in their secondary school.

C. Required Components for the SHSM–Mining

Required Components for the SHSM–Mining

1. a bundle of 9 Grade 11 and Grade 12 credits that includes:
   - i) 4 mining major credits that provide sector-specific knowledge and skills;
   - ii) 3 other required credits from the Ontario curriculum, in English, mathematics, and science, in which some expectations are met through learning activities contextualized to the mining sector;
   - iii) 2 cooperative education credits that provide authentic learning experiences in a workplace setting, enabling students to refine, extend, apply, and practise sector-specific knowledge and skills
2. 7 sector-recognized certifications and/or training courses/programs (4 compulsory and a choice of 3 from a list of additional certifications and training courses/programs)
3. experiential learning activities within the sector
4. "reach ahead" experiences connected with the student's postsecondary pathway
5. development of Essential Skills and work habits required in the sector, and use of the Ontario Skills Passport (OSP) for purposes of documentation

Students earning an SHSM receive an OSSD with the red SHSM seal as well as an SHSM Record that documents the student's achievement of the required components.

The five required components for an SHSM diploma designation are designed to give students a rich and varied range of curriculum-based and experiential learning experiences, as a foundation for making a successful transition to their chosen postsecondary education or training program or occupation.

Local circumstances, such as facilities and equipment, staff qualifications, partnerships, and agreements, determine how the SHSM's required components can be offered to students. Depending on these circumstances, the components may be delivered in a secondary school, college, training centre, other approved site, or a combination of these delivery settings. See the *SHSM Implementation Guide* for more information on delivery models.

No substitutions for any of the five required components of an SHSM are permitted.

1. Bundled Credits

Each SHSM has a bundle of credits that consists of major credits, other required credits, and cooperative education credits. The bundle for the SHSM–Mining consists of:

i) 4 major credits;

ii) 3 other required credits;*

iii) 2 cooperative education credits.

The credits in the bundle prepare students for one of four postsecondary options – apprenticeship training, college, university, or the workplace.

i) Major credits

Each SHSM has four major credits that enable students to build a foundation of sector-focused knowledge and skills. The major credits may be:

- credits for Ontario curriculum courses;
- credits for ministry-approved locally developed courses (LDCs); or
- dual credits, which are subject to their own policies and procedures.

ii) Other required credits

In addition to the major credits, each SHSM includes *other required credits* from the Ontario curriculum. (In the SHSM–Mining, the other required credits are in English, mathematics, and science.) These courses are delivered by the teachers of the required subjects and involve the use of contextualized learning activities (CLAs), which enable students to connect their learning in these courses to their SHSM sector. CLAs are based on curriculum expectations from the required course. One or more CLAs, totalling a minimum of six hours in length, must be incorporated into each required course. (A CLA template is provided in Appendix A.)

iii) Cooperative education credits

Cooperative education provides authentic learning experiences in a workplace setting that enable students to refine, extend, apply, and practise the sector-specific knowledge and skills acquired in the bundle of credits. Each SHSM requires that students complete a minimum of two credits in cooperative education linked to the major credits. (More than two credits are recommended, if the student's timetable permits.)

Students may earn their minimum of two cooperative education credits in Grade 11 and/or Grade 12, as a single credit in each grade or a double credit in one grade. (Students in the university pathway, however, are advised to complete their cooperative education credits in Grade 11, in order to allow room in their timetables in Grade 12 for credits needed to meet university entrance requirements.) Depending on local circumstances, students may have to complete their cooperative education credits through continuing

* SHSMs in other sectors may require 2, 3, or 4 "other" credits. For details, see the other sector-specific guides.

education, in the summer, or through virtual cooperative education. See *Cooperative Education and Other Forms of Experiential Learning: Policies and Procedures for Ontario Secondary Schools, 2000*.

Summary of the Required Credits in the Bundle for the SHSM–Mining

The 9 required credits in the bundle for the SHSM–Mining are identified in the table below. No substitutions for the credits in the bundle are allowed, and the credits must be at the specified grade level. School boards are required to submit for ministry approval their proposed pathway chart for each SHSM offered by their schools, indicating the credits in each bundle by pathway. Once a credit bundle is approved, the board may not change any of the credits in the bundle for that school year.

Required Credits in the Bundle for the SHSM–Mining

Credits	Apprenticeship Training		College		University		Workplace	
	Gr. 11	Gr. 12	Gr. 11	Gr. 12	Gr. 11	Gr. 12	Gr. 11	Gr. 12
Mining Major*	2	2	2	2	2	2	2	2
English		1		1		1		1
Mathematics	1			1		1	1	
Science	1		1		1		1	
Cooperative Education	2		2		2		2	
Total number of credits	9		9		9		9	

* Multiple credits in the Ontario technological education curriculum allow additional instructional time for the practice and refinement of skills needed to develop student performance to the levels required for certification, entry into apprenticeship programs, or participation in school–work transition programs (see *The Ontario Curriculum, Grades 11 and 12: Technological Education, 2000*, page 6).

A pathways chart is given on page 14, showing subjects and courses that students could take to explore the SHSM in mining in Grades 9 and 10, and courses they would have to take in Grades 11 and 12 to complete this specialized program. Sample bundles of credits that would meet the requirements for the SHSM–Mining are provided in the chart on page 15.

2. Sector-Recognized Certification and Training

Sector-recognized certifications and training courses/programs, including those addressing safety, are important for students who are working towards the SHSM and provide them with an advantage when they are entering the workforce, whatever their chosen career goal may be.

Certification and training courses/programs must:

- be delivered by a certified trainer – a person recognized by the certification provider or by the sector as an authority. (This requirement does not apply to WHMIS.);
- include an assessment and evaluation component;

- include, wherever possible, documentation such as a certificate or other proof of completion for the student's portfolio and the student's SHSM Record. The SHSM Record will indicate the title of each certification earned or training course/program completed, the number of hours involved, and the date the certification/training was completed.

The SHSM in mining requires students to complete seven (7) sector-recognized certifications and/or training courses/programs. Of these, four (4) are compulsory and the remaining three (3) are to be chosen from the list in the following chart. These requirements are summarized below.

SHSM–Mining: Sector-Recognized Certification and Training

Four (4) compulsory			
Standard First Aid	Cardio-Pulmonary Resuscitation (CPR)	General Safety Awareness (GSA)	generic (i.e., not site-specific) instruction about the Workplace Hazardous Materials Information System (WHMIS)
Three (3) from the list below			
certified GPS training, including map and compass	chain saw safety	confined space awareness	electrical safety
elevating work platforms	fall protection	hoisting and rigging	lift truck safety
lock out and tagging	personal protective equipment in mining	powder-actuated tools	radio operator
surface miner and underground orientation	suspended access equipment	trenching safety	

Note: Items that are capitalized are the *proper names* of specific certifications or training courses/programs that are appropriate for the SHSM. Items that are lowercased are names of the areas or categories within which specific certification or training courses/programs should be selected by the school or board.

Boards and schools may provide opportunities for students to complete additional training.

No substitutions for items in the above lists or changes in the *number* of required certifications and training courses/programs are permitted.

3. Experiential Learning Activities

The SHSM experiential learning requirement consists of planned learning activities that take place outside the traditional classroom setting. Experiential learning, which can include job shadowing, job twinning, work experience, virtual work experience, and cooperative education (see Appendix B), enables students enrolled in the SHSM to find out about opportunities available to them in connection with the careers that interest them.

Experiential learning activities give students opportunities to explore, observe, participate in, and reflect on a variety of sector-specific experiences and careers. They also enable students to increase their awareness of, and develop, the Essential Skills and work habits required in the sector, and have their performance of those skills and habits assessed and documented, using tools connected with the Ontario Skills Passport. An experiential assignment or task could require students to identify examples of how the Essential Skills are applied in specific trades and administrative and management occupations (e.g., estimator, safety officer) in a mining business.

Experiential learning opportunities could include:

- one-on-one observation of a cooperative education student at a placement in the mining sector (example of job twinning);
- a day-long observation of a skilled tradesperson in the mining sector (example of job shadowing);
- a one- or two-week work experience with a member of an industry association or a professional in the sector (example of work experience);
- a field trip to an industry site;
- attendance at a conference or symposium related to the mining sector;
- participation in a *Mine Rescue* competition;
- attendance at an orientation to engineering day at a university to promote careers in engineering.

An experiential learning activity connected with the student's postsecondary pathway can be considered a "reach ahead" experience (see section 4, below). For example, job shadowing a skilled tradesperson in a local mining business would be an experiential learning activity for all students in a Mining SHSM, but it could also be a "reach ahead" experience for a student considering a career as such a tradesperson. Note, however, that the activity can be recorded *only once* on the student's SHSM Record – as either an experiential learning activity or a "reach ahead" experience. This restriction reflects the expectation, described earlier, that the student's SHSM program will offer a rich and varied range of experiential learning opportunities.

Cooperative education is also a form of experiential learning. However, for the purposes of the SHSM program requirements and the student's SHSM Record, the two cooperative education credits must be counted as part of the SHSM bundled credit requirement.

Experiential learning placements for students must be arranged by the school and must meet the following requirements:

- A placement must be assessed by a teacher before the student is assigned to it to ensure that the placement offers a positive learning environment and a safe workplace. (*See Cooperative Education and Other Forms of Experiential Learning: Policies and Procedures for Ontario Secondary Schools*, 2000. Available online at www.edu.gov.on.ca/eng/document/curricul/secondary/coop/cooped.pdf.)
- A placement must have Workplace Safety and Insurance Board coverage through the ministry or the workplace.(See Policy/Program Memorandum No. 76A, September 27, 2000; excerpted in Appendix B of the *SHSM Implementation Guide*.)

For more information consult *Live Safe! Work Smart! Appendix for Cooperative Education and Other Forms of Experiential Learning*, at www.livesafeworksmart.net/english/coop/coop_appdx.htm.

For a summary of the regulations governing age requirements for working in and/or visiting workplaces in Ontario, see Appendix C.

4. "Reach Ahead" Experiences

Students in the SHSM in mining must have learning experiences connected with their postsecondary pathway. "Reach ahead" experiences can range from visiting a college to investigate the program a student is considering, to sitting in on university classes in a student's field of interest, to discussing the postsecondary education, training, and experiences of someone in the occupation a student is interested in. These experiences can vary in length – from a few hours to the time necessary for a full course. Examples include:

- *Workplace:* interviewing a heavy equipment operator to identify safety considerations and the unique aspects of the position
- *Apprenticeship training:* job shadowing a mechanic who services vehicles at a mining site
- *College:* touring a lab to observe assaying procedures for geological samples
- *University:* job shadowing a mining engineer for a day
- *All pathways:* attending a professional trade show or conference held by the mining sector

Every "reach ahead" experience should have an assignment or task associated with it. For example, the assignment for a student considering an apprenticeship pathway could be to interview a tradesperson to discover details about his or her training, and to write a report summarizing the tradesperson's answers.

5. Development of Essential Skills and Work Habits, and Use of the Ontario Skills Passport (OSP) for Purposes of Documentation

Human Resources and Social Development Canada (HRSDC) has identified and validated the Essential Skills that people need for life, learning, and work. Essential Skills are foundational skills that make it possible to learn technical skills and other job- or workplace-specific skills.

They are skills that enable people to perform tasks required in their jobs and to participate fully in the workplace and in the community. These Essential Skills are transferable from school to work, job to job, and sector to sector. The Ministry of Education and the Ministry of Training, Colleges and Universities have developed the Ontario Skills Passport (OSP) on the basis of the HRSDC's Essential Skills. The OSP also incorporates work habits that are beneficial not only for work but also for life and learning. The skills and work habits included in the OSP are as follows:

Essential Skills	Work Habits
• Reading Text • Writing • Document Use • Computer Use • Oral Communication *Numeracy* • Money Math • Scheduling or Budgeting and Accounting • Measurement and Calculation • Data Analysis • Numerical Estimation *Thinking Skills* • Job Task Planning and Organizing • Decision Making • Problem Solving • Finding Information	• Working Safely • Teamwork • Reliability • Organization • Working Independently • Initiative • Self-Advocacy • Customer Service • Entrepreneurship

The Ontario Skills Passport provides clear descriptions of Essential Skills that are used in nearly all occupations and of work habits that are important for success in the workplace. The OSP provides a common language that helps students build competence and confidence and make connections between school and their prospective careers. The OSP also provides employers with a consistent method of assessing the student's demonstration of these skills and work habits in the workplace.

Sector representatives consulted on the development of the SHSMs emphasized the importance of the Essential Skills and work habits included in the OSP. Students pursuing an SHSM in mining track their development of Essential Skills and work habits in their OSP Work Plan throughout their experiential learning activities (including cooperative education placements and "reach ahead" experiences). In consultation with the teacher, employers assess each student's demonstration of Essential Skills and work habits identified in the OSP and record their assessments in the student's OSP Work Plan.

See the *SHSM Implementation Guide* for more information about the OSP and how it can be used in connection with an SHSM program. The OSP website (http://skills.edu.gov.on.ca) also offers resources for the use of the OSP in SHSM programs.

D. Pathways for the SHSM–Mining

This section contains the following:

- ideas that schools and boards can use to promote awareness and exploration of the SHSM–Mining among students and to help students as they make the decision to specialize in this program
- a chart showing a pathways template for completing the SHSM–Mining
- a chart that contains sample bundles of credits for the SHSM–Mining

Strategies for Promoting and Suggestions for Planning the SHSM–Mining

Grades 7 and 8: Awareness

The following are examples of strategies that boards and schools can use to build Grade 7 and 8 students' awareness of the SHSM program:

- organize field trips, competitions, and activities in the community that are specific to the SHSM
- host presentations or talks on careers with guest speakers and mentors from the sector
- hold a summer program sponsored by the sector before students enter secondary school
- organize experiences at a secondary school in the program related to this sector
- invite current SHSM–Mining students to share their experiences

Grades 9 and 10: Exploration

Students who are considering pursuing the SHSM–Mining can be encouraged to enrol in the following courses to become better informed about careers and postsecondary options related to the mining sector:

- Integrated Technologies: A Grade 9 course recommended for all SHSM pathways that have a technological education focus. It provides students with opportunities to explore a variety of technologies, including mining technology, by engaging in activities related to them.
- Career Studies (compulsory) and the Discovering the Workplace: Some of the expectations in these Grade 10 courses provide opportunities for students to explore occupations and other postsecondary options in the sector and to participate in experiential learning activities.

- Transportation Technology or Technological Design: Recommended for any Grade 10 student who is considering entering an SHSM–Mining. They provide students with opportunities to explore mining equipment and design, identify personal interests and aptitudes, and investigate the SHSM–Mining.

Grades 11 and 12: Specialization

Students acquire the sector-specific knowledge and skills required to earn their OSSD with an SHSM–Mining by completing its five required components. Students and their parents/guardians are encouraged to consult with guidance counsellors and teachers to select the courses that will enable them to pursue their goals.

Students pursuing an apprenticeship pathway should consider the Ontario Youth Apprenticeship Program (OYAP), which enables them to start an apprenticeship while earning their OSSD.

Pathways Template for the SHSM–Mining

- Shaded boxes – required credits in the bundle for the SHSM–Mining
- (C) – compulsory credits for the OSSD
- (R) – courses that are recommended in light of the student's pathway and career interests

Grade 9 *Exploration*	**Grade 10** *Exploration*	**Apprenticeship Training Pathway** *Specialization*		**College Pathway** *Specialization*		**University Pathway** *Specialization*		**Workplace Pathway** *Specialization*	
		Grade 11	**Grade 12**	**Grade 11**	**Grade 12**	**Grade 11**	**Grade 12**	**Grade 11**	**Grade 12**
An optional or a compulsory credit	An optional or a compulsory credit	An optional or a compulsory credit	An optional or a compulsory credit	An optional or a compulsory credit	An optional or a compulsory credit	An optional or a compulsory credit	An optional or a compulsory credit	An optional or a compulsory credit	An optional or a compulsory credit
(C) English	(C) English	(C) English	(C) English	(C) English	(C) English	(C) English	(C) English	(C) English	(C) English
(C) Mathematics	(C) Mathematics	(C) Mathematics	(R) Mathematics	(C) Mathematics	Mathematics	(C) Mathematics	Mathematics	(C) Mathematics	(R) Mathematics
(C) Science	(C) Science	(C) Science *in either Gr. 11 or Gr. 12*	Science *in either Gr. 11 or Gr. 12*	(C) Science *in either Gr. 11 or Gr. 12*	Science *in either Gr. 11 or Gr. 12*	(C) Science	(R) Science	(C) Science	An optional or a compulsory credit
(C) Geography of Canada	(C) Canadian History	**Mining Major**	**Mining Major**	**Mining Major**	**Mining Major**	**Mining Major**	**Mining Major**	**Mining Major**	**Mining Major**
(C) Core French	(C) Career Studies/ Civics	**Mining Major**	**Mining Major**	**Mining Major**	**Mining Major**	**Mining Major**	**Mining Major**	**Mining Major**	**Mining Major**
(C) Healthy Active Living Education	(C) The Arts	May be used as a (C) Cooperative Education (2 credits) *in either Gr. 11 or Gr. 12*		May be used as a (C) Cooperative Education (2 credits) *in either Gr. 11 or Gr. 12*		May be used as a (C) Cooperative Education (2 credits) *recommended in Gr. 11**		May be used as a (C) Cooperative Education (2 credits) *in either Gr. 11 or Gr. 12*	
(R) Integrated Technologies	(R) Transportation Technology or Technological Design	An optional or a compulsory credit	An optional or a compulsory credit or Cooperative Education	An optional or a compulsory credit	An optional or a compulsory credit or Cooperative Education	(R) Science	(R) Mathematics	An optional or a compulsory credit or Cooperative Education	An optional or a compulsory credit or Cooperative Education

* Students in the university pathway are advised to complete their cooperative education credits in Grade 11, in order to allow room in their timetables in Grade 12 for credits needed to meet university entrance requirements.

Sample Bundles of Credits for the SHSM–Mining

- Shaded boxes – required credits in the bundle for the SHSM–Mining
- (C) – compulsory credits for the OSSD
- (R) – courses that are recommended in light of the student's pathway and career interests
- The letters C, E, M, O, and U at the end of course codes indicate the following types of courses: C – college preparation; E – workplace preparation; M – university/college preparation; O – open; U – university preparation
- A list of **all** courses that are approved for inclusion in the bundle of credits for an SHSM–Mining is available on the Ministry of Education website, at www.edu.gov.on.ca.

Apprenticeship Training Pathway		**College Pathway**		**University Pathway**		**Workplace Pathway**	
Grade 11	**Grade 12**	**Grade 11**	**Grade 12**	**Grade 11**	**Grade 12**	**Grade 11**	**Grade 12**
An optional or a compulsory credit	An optional or a compulsory credit	An optional or a compulsory credit	An optional or a compulsory credit	An optional or a compulsory credit	An optional or a compulsory credit	An optional or a compulsory credit	An optional or a compulsory credit
(C) ENG3C English	(C) ENG4C English	(C) ENG3C English	(C) ENG4C English	(C) ENG3U English	(C) ENG4U English	(C) ENG3E English	(C) ENG4E English
(C) MCF3M Functions and Applications	(R) MCT4C Mathematics for College Technology	(C) MCF3M Functions and Applications	MCT4C Mathematics for College Technology	(C) MCR3U Functions	MHF4U Advanced Functions	(C) MEL3E Mathematics for Work and Everyday Life	(R) MEL4E Mathematics for Work and Everyday Life
SNC3M Science	SPH4C Physics	SNC3M Science	SPH4C Physics	SCH3U Chemistry	(R) SPH4U Physics	SNC3E Science	GLN4O Navigating the Workplace
Mining Major SGM3B (LDC)*	**Mining Major** TTJ4C or TTJ4E Transportation Technology	**Mining Major** SGM3B (LDC)*	**Mining Major** SCH4C Chemistry	**Mining Major** SGM3B (LDC)*	**Mining Major** SCH4U Chemistry	**Mining Major** SGM3B (LDC)*	**Mining Major** TTJ4E Transportation Technology
Mining Major TTJ3C or TTJ3E Transportation Technology	**Mining Major** TTJ4C or TTJ4E Transportation Technology	**Mining Major** TDJ3M Technological Design or TTJ3C Transportation Technology	**Mining Major** TDJ4M Technological Design or TTJ4C Transportation Technology	**Mining Major** TDJ3M Technological Design	**Mining Major** TDJ4M Technological Design	**Mining Major** TTJ3E Transportation Technology	**Mining Major** TTJ4E Transportation Technology
May be used as a (C) Cooperative Education (2 credits) *in either Gr. 11 or Gr. 12*		May be used as a (C) Cooperative Education (2 credits) *in either Gr. 11 or Gr. 12*		May be used as a (C) Cooperative Education (2 credits) *recommended in Gr. 11***		May be used as a (C) Cooperative Education (2 credits) *in either Gr. 11 or Gr. 12*	
CGT3E Geographics: The Geographer's Toolkit	SCH4C Chemistry	CGF3M Physical Geography: Patterns, Processes, and Interactions	CGO4M Geomatics: Geotechnologies in Action	(R) SPH3U Physics	(R) MCV4U Calculus and Vectors	CGT3E Geographics: The Geographer's Toolkit	Cooperative Education

* For an outline of this course, see Appendix D.

** Students in the university pathway are advised to complete their cooperative education credits in Grade 11, in order to allow room in their timetables in Grade 12 for credits needed to meet university entrance requirements.

E. Occupations in the Mining Sector

The National Occupational Classification (NOC) is a system that describes and classifies all occupations in Canada using four-digit codes called National Occupation Codes (NOCs). This system and the codes are the authoritative source for occupational information in Canada. Entering one of these four-digit codes in the "Quick Search" box on the NOC website (http://www23.hrdc-drhc.gc.ca/2001/e/generic/welcome.shtml) provides occupational information related to that career.

For more information on occupations, go to the Ontario Skills Passport website (http://skills.edu.gov.on.ca), click on "Occupations and Tasks" in the navigation bar, select "Sorted by NOC", and click on the "Sample Workplace Tasks" checkmark for one of the occupations to view a description of the occupation, an overview of the Essential Skills required in the occupation, a list of sample tasks for the occupation, and assessment tools and other career and employment information related to the occupation.

The following are examples of occupations in the mining sector, with corresponding NOC codes, sorted according to the type of postsecondary education or training the occupations would normally require.

Note: Some of the names of occupations given below may differ slightly from the names in the NOC. The names listed here reflect common usage by institutions and organizations in this sector in Ontario.

Apprenticeship Training • Electrician 7242 • Heavy Duty Equipment Mechanic 7312 • Industrial Mechanic 2433 • Machinist 7231	**College** • Geological Technician 2212 • Instrumentation Technician 2243 • Mechanical Engineering Technologist 2232 • Mine Development Technologist 2212 • Mining Technician 2212

University
• Geologist 2113
• Mechanical Engineer 2132
• Mining Engineer 2143
	Workplace
	• Control and Process Operator 9231
	• Geology Technical Assistant 2212
	• Heavy Duty Equipment Operator 7421
	• Mechanic's Helper 7612
	• Mine Labourer 8614
	• Sampler 9415
	• Underground Mine Service and Support Workers 8411
	  ◦ Cage Tender
	  ◦ Crusher Operator

F. Postsecondary Programs and Training Related to Careers in the Mining Sector

The following are examples of programs and training related to careers in the mining sector and the accreditations or types of accreditation each results in:

Apprenticeship Training

Heavy Duty Equipment Mechanic	Certificate of Apprenticeship/ Certificate of Qualification
Mechanic	Certificate of Apprenticeship/ Certificate of Qualification

College

Electrical Engineering Technician – Industrial	Diploma
Mining and Environment – Regulations and Compliance	Bachelor's degree
Mining Engineering Technology	Advanced diploma
Mining Science and Management	Bachelor's degree

University

Earth Sciences – Geology	Bachelor's degree
Geological Engineering	Bachelor's degree
Geology	Bachelor's degree
Metallurgical Control Analyst	Bachelor's degree
Metallurgical Engineer	Bachelor's degree
Mining Engineering	Bachelor's degree

Training for the Workplace

Flux Cored Arc Welding	Certificate
Gas Metal Arc Welding	Certificate
Mechanical Techniques – CNC/CAD/CAM Specialist	Certificate
Mechanical Techniques – Design	Certificate
Mechanical Techniques – Mining	Certificate
Mining Techniques	Certificate
Welding Techniques	Certificate

G. Resources

Associations and Other Professional Groups

Alliance of Sector Councils	www.councils.org
Canadian Institute of Mining and Metallurgy	www.cim.org
Conference Board of Canada	www.conferenceboard.ca
International Technology Education Association (ITEA)	www.iteaconnect.org/
Mining Association of Canada	www.mining.ca/www/
Mining Industry Human Resources Council	www.mihr.ca
Ontario Cooperative Education Association	www.ocea.on.ca
Ontario Council for Technology Education (OCTE)	www.octe.on.ca
Ontario Mining Association	www.oma.on.ca
Ontario School Counsellors' Association	www.osca.ca
Prospectors and Developers Association of Canada	www.pdac.ca
Skills Canada	www.skillscanada.com
Skills Canada–Ontario	www.skillsontario.com

Careers

Apprenticeship Search	www.apprenticesearch.com
Canada Job Futures	www.jobfutures.ca
Career Cruising	www.careercruising.com
CBC Learning	www.cbclearning.ca
Employment Ontario	www.edu.gov.on.ca/eng/tec/etlanding.html
Job Bank	www.jobbank.gc.ca
Labour Market Information	www.labourmarketinformation.ca/

Ontario Prospects	www.ontarioprospects.info
Ontario Skills Passport (OSP)	http://skills.edu.gov.on.ca
Ontario WorkInfoNet	www.onwin.ca/english
Statistics Canada	www.statcan.ca
Youth Opportunities Ontario	www.youthjobs.gov.on.ca

Education/Government

Applications of Working and Learning National Project	www.awal.ca/about.asp
Centre for Excellence in Mining Innovation	www.cemi.laurentian.ca/Laurentian/Home/Departments/CEMI
Federal Resources for Educational Excellence	www.free.ed.gov
Independent Learning Centre	www.ilc.org
Industry Canada	www.ic.gc.ca/epic/site/ic1.nsf/en/home
Mineral Exploration and Mining	www.gov.on.ca/ont/portal/!ut/p/.cmd/cs/.ce/7_0_A/.s/7_0_252/_s.7_0_A/7_0_252/_l/en?docid=STEL01_049810
Mining Sector Council	www.mihr.ca
Ministry of Education	www.edu.gov.on.ca
Ministry of Labour	www.labour.gov.on.ca
Ministry of Research and Innovation	www.mri.gov.on.ca
Ministry of Small Business and Entrepreneurship	www.sbe.gov.on.ca
Ministry of Training, Colleges and Universities	www.edu.gov.on.ca/eng/tcu
Natural Resources Canada	www.nrcan.gc.ca/mms/
Ontario College Application Service	www.ontariocolleges.ca
Ontario Universities' Application Centre	www.ouac.on.ca
Passport to Prosperity	www.edu.gov.on.ca/passport
Prospectors and Developers Association Mining Matters	www.pdac.ca/miningmatters
Towes: How Do Your Skills Measure Up? Skill Plan	http://measureup.towes.com

Safety, Training, and Certifications

Canada Safety Council (CSC)	www.safety-council.org/
Canadian Centre for Occupational Health and Safety (CCOHS)	www.ccohs.ca/
Canadian Red Cross Society	www.redcross.ca
Industrial Accident Prevention Association (IAPA)	www.iapa.ca
Interprovincial Standards Red Seal Program	www.red-seal.ca
Lesson Plans for the Trades	www.khake.com/page82.html
Lifesaving Society	www.lifesaving.ca/
Live Safe! Work Smart!	www.livesafeworksmart.net/
Mines and Aggregates Safety and Health Association	www.masha.on.ca
NORCAT	www.norcat.org
Passport to Safety	www.passporttosafety.com
Prevention Dynamics	www.preventiondynamics.com
St. John Ambulance	www.sja.ca
Virtual WHMIS	www.virtualwhmis.com
Workplace Safety and Insurance Board (WSIB)	www.wsib.on.ca

H. Appendices

Appendix A: Contextualized Learning Activities (CLAs) for the Specialist High Skills Majors

For the "other required credits" in the bundle of credits, students in a Specialist High Skills Major program must complete learning activities that are contextualized to the knowledge and skills relevant to the economic sector of the SHSM. Contextualized learning activities (CLAs) address curriculum expectations in these courses.

CLAs must take a minimum of 6 hours to complete. Boards may choose to develop one activity that takes 6 hours to complete or two or more activities that together take a minimum of 6 hours to complete.

This template must be used to describe the CLAs. The completed form must be submitted to the Ministry of Education for approval.

(continued)

Appendix A ***(continued)***

Contextualized Learning Activity (CLA) Template

Submit all material in Microsoft Word.

Contact Information

Board: _____

Development date: _____

Contact person: _____

Position: _____

Phone: ( )_____-_____ Fax: ( )_____-_____ E-mail: _____

Specialist High Skills Major	
Course code and course title	
Name of contextualized learning activity/activities	

Brief description of contextualized learning activity/activities	
Duration	*(A minimum of 6 hours to complete the CLA(s) is required.)*
Overall expectations	*(Identify the overall expectation(s) to be assessed and/or evaluated through the CLA(s). Include strand title(s).)*
Specific expectations	*(Identify the specific expectations related to the above overall expectation(s) that are addressed in the instructional and assessment strategies of the CLA(s). Include strand title(s) and suborganizer(s).)*
Essential Skills and work habits from the OSP	*(List the Essential Skills and work habits from the OSP that are addressed in the CLA(s).)*
Catholic graduate expectations (if applicable)	

Instructional/Assessment Strategies

Teacher's Notes *(Provide suggestions that will assist the teacher in delivering the CLA(s). For example, remind teachers to make sure that handouts, such as authentic workplace materials/documents used by the sector, are available for the activity.)*

Context *(Describe the workplace context for the activity/activities.)*

Strategies *(In point form, describe the sequence of instructional and assessment strategies that will support the intended learning. Attach all student handouts and worksheets.)*

Assessment and Evaluation of Student Achievement – Summary

(List all assessment and evaluation strategies and tasks, based on the strategies identified in the preceding section. Attach checklists, rubrics, correction keys, etc.)

Strategies/Tasks *(add rows as required)*	**Purpose** Assessment for learning (diagnostic, formative) *OR* Assessment of learning (summative; for evaluation)
1.	
2.	
3.	
4.	
5.	
6.	

Additional Notes/Comments/Explanations

(Provide additional suggestions for teachers that will help them deliver the CLA(s).)

Resources

(List all the resources needed to support the implementation of the CLA(s).)

Authentic Workplace Materials *(e.g., blueprints, workplace manuals, specification sheets, spreadsheets)*

Human Resources

Print

Video/DVD

Software

Websites

Other

Accommodations

(List instructional, environmental, and assessment accommodations.)

List of Attachments

(Attach all related materials, e.g., student worksheets, tests, rubrics.)

Appendix B: Forms of Experiential Learning and Related Programs

Length	Credit Value	Description	Key Elements
Job shadowing			
1/2 to 1 day (in some cases, up to 3 days)	none	one-on-one observation of a worker at a place of employment	• involves the pairing of a student with a worker in a specific occupation • may be integrated with a credit course • may be part of a student's school–work transition program
Job twinning			
1/2 to 1 day	none	one-on-one observation of a cooperative education student at his or her placement	• involves the pairing of a student with a cooperative education student • may be integrated with a credit course • may be part of a student's school–work transition program
Work experience			
1–4 weeks	none	a planned learning opportunity, within any credit course, that provides students with relatively short-term work experiences, usually of one or two weeks' duration and not exceeding four weeks	• involves a short-term, subject-related work placement • forms an integral part of a specific credit course • requires pre-placement orientation • requires a personalized placement learning plan
Virtual work experience			
the equivalent of 1–4 weeks	none	a simulated work experience, within any credit course, that allows students, including students who receive a special education program or services and students in rural areas, to take advantage of a greater variety of experiences than those available in the local economy	• involves a short-term, subject-related virtual work placement facilitated through the use of computer software and the Internet • forms an integral part of a specific credit course • requires pre-placement orientation • requires a personalized placement learning plan
Cooperative education			
full term (year or semester)	1 credit per 110-hour cooperative education credit course successfully completed	a planned learning experience, for which credits are earned, that integrates classroom theory and learning experiences at a workplace to enable students to apply and refine the knowledge and skills acquired in a related curriculum course or a locally developed course	• requires a personalized placement learning plan • involves the earning of credits • requires 15 hours of pre-placement instruction • is monitored by the cooperative education teacher • has a classroom and a workplace component • involves reflective learning • requires 7 hours of integration per co-op credit

Length	Credit Value	Description	Key Elements
School–work transition programs			
varies, but typically not less than 2 years (3–4 semesters over Grades 11 and 12)	varies with type of planned workplace experience	a combination of school- and work-based education and training involving a variety of learning opportunities	• is oriented towards students who will be entering the workforce directly after high school • involves the development of partnerships with employers • involves the enhancement of curriculum with input from employers • involves the earning of cooperative education credits
Ontario Youth Apprenticeship Program (OYAP)			
varies, but typically not less than 2 years (3–4 semesters over Grades 11 and 12)	varies with opportunities	an opportunity for a student to meet diploma requirements while participating in an apprenticeship occupation	• is designed for students 16 years of age and older who have already earned 16 credits towards the OSSD • may involve the student's registration in an apprenticeship • requires documentation by the student and trainer regarding trade-specific competencies acquired • involves the earning of cooperative education credits

(From Ontario Ministry of Education, *Cooperative Education and Other Forms of Experiential Learning: Policies and Procedures for Ontario Secondary Schools, 2000*, pp. 7–8)

Appendix C: Minimum Age to Work in and Visit Ontario Workplaces[1]

Specialist High Skills Major[2]	Type of Workplace	Minimum Age to Work	Minimum Age to Visit / Conditions for Visiting[3]
• Arts and Culture • Business • Health and Wellness • Hospitality and Tourism	Industrial establishments,[4] such as offices, stores, arenas, restaurant serving areas	14	The regulation governing industrial establishments (Reg. 851, R.R.O. 1990) made under the OHSA sets out minimum age restrictions for workers, covering workplaces such as offices, stores, arenas, restaurants, and factories. However, the regulation states that people younger than the specified minimum age to work may *visit* (but not *work in*) these establishments if: • they are accompanied by a person who has attained the age of majority (i.e., 18 years of age); • they are being guided on a tour of the industrial establishment (e.g., office, store, arena, or factory); • they are in an area of the industrial establishment used for sales purposes; or • they are in an area of the establishment to which the public generally has access.
• Business • Hospitality and Tourism • Manufacturing • Transportation	Most factories,[5] including restaurants and any commercial kitchens, automotive service garages, produce and meat preparation or shipping and receiving areas in grocery stores, laundries, and warehouses	15	
• Forestry	Logging operations[6]	16	
• Construction	Construction project[7]	16 Under the regulation governing construction projects (O. Reg. 213/91) made under the OHSA, 16 is the minimum age to work on *or* to visit *any* construction project. A person under the age of 16 may *visit* a construction site *only when work is not being performed there*. (Note that the definitions of *construction* and *construction project* include a wide variety of types of work and workplaces. It is important to review the definitions carefully. See note 7, below.)	

All notes appear on pages 33–35.

Specialist High Skills Major[2]	Type of Workplace	Minimum Age to Work	Minimum Age to Visit / Conditions for Visiting[3]
• Mining	Surface mines,[4] mining plants[5] Underground mine Working face of a surface mine	16 18 18	The regulation governing mines and mining plants (Reg. 854, R.R.O. 1990) made under the OHSA allows for tours or visits to mines and mining plants by persons who are younger than the specified minimum age to work if they are accompanied by and under the direction of a guide.
• Agriculture • Arts and Culture • Environment • Health and Wellness • Horticulture and Landscaping	Certain workplaces (or parts thereof) may be covered, with respect to age restrictions, by regulations governing other sectors. For example, see the industrial establishments regulation (Reg. 851, R.R.O. 1990).		
• Construction • Manufacturing	Window cleaning	18	*Not applicable.* (The regulation governing window cleaning is Reg. 859, R.R.O. 1990.)

Notes to Appendix C

1. As specified in regulations made under the Occupational Health and Safety Act (OHSA). Other statutes and regulations made under those statutes also set minimum ages for various occupations.

   In addition, some workplaces have established their own, *more stringent* minimum ages for employment. For instance, some retail establishments and restaurant chains will not hire anyone under the age of 16, even though the legislated minimum age limit is lower. Similarly, some industrial establishments, and other workplaces that require the use of heavy equipment or machinery, will not hire anyone under the age of 18, even though the legislated minimum age limit might be lower. Such in-house minimum age requirements may be acceptable, as long as the limits do not conflict with the Ontario Human Rights Code or other applicable law.

2. Column 1 identifies the Specialist High Skills Majors with which the workplace categories in column 2 may be associated. Note, however, that some specialist programs may involve workplaces identified in more than one category (e.g., a business program may involve offices, factories, and construction sites). When using this chart to verify compliance

(continued)

with minimum age to work and visit requirements, always refer to the particular type of workplaces involved in the program (column 2), not to the sector to which the program relates (column 1).

3. Under certain conditions, as identified in this table, persons younger than the minimum age to work may visit, *but not work in*, certain workplaces.

4. According to the OHSA, ***industrial establishment*** means an office building, factory, arena, shop or office, and any land, buildings and structures appertaining thereto.

5. According to the OHSA, ***factory*** means

   a) a building or place other than a mine, mining plant or place where homework is carried on, where,

      i) any manufacturing process or assembling in connection with the manufacturing of any goods or products is carried on,

      ii) in preparing, inspecting, manufacturing, finishing, repairing, warehousing, cleaning or adapting for hire or sale any substance, article or thing, energy is,

         (A) used to work with any machinery or device, or

         (B) modified in any manner,

      iii) any work is performed by way of trade or for the purposes of gain in or incidental to the making of any goods, substance, article or thing or part thereof,

      iv) any work is performed by way of trade or for the purposes of gain in or incidental to the altering, demolishing, repairing, maintaining, ornamenting, finishing, storing, cleaning, washing or adapting for sale of any goods, substance, article or thing, or

      v) aircraft, locomotives, or vehicles used for private or public transport are maintained,

   b) a laundry including a laundry operated in conjunction with,

      i) a public or private hospital,

      ii) a hotel, or

      iii) a public or private institution for religious, charitable or educational purposes, and

   c) a logging operation.

6. According to the OHSA, ***logging*** means the operation of felling or trimming trees for commercial or industrial purposes or for the clearing of land, and includes the measuring, storing, transporting or floating of logs, the maintenance of haul roads, scarification, the carrying out of planned burns and the practice of silviculture.

7. According to the OHSA, ***construction*** includes erection, alteration, repair, dismantling, demolition, structural maintenance, painting, land clearing, earth moving, grading, excavating, trenching, digging, boring, drilling, blasting or concreting, the installation of any machinery or plant, and any work or undertaking in connection with a project but does not include any work or undertaking underground in a mine.

Project means a construction project, whether public or private, including,

a) the construction of a building, bridge, structure, industrial establishment, mining plant, shaft, tunnel, caisson, trench, excavation, highway, railway, street, runway, parking lot, cofferdam, conduit, sewer, water main, service connection, telegraph, telephone or electrical cable, pipe line, duct or well, or any combination thereof,

b) the moving of a building or structure, and

c) any work or undertaking, or any lands or appurtenances used in connection with construction.

8. According to the OHSA, ***mine*** means any work or undertaking for the purpose of opening up, proving, removing or extracting any metallic or non-metallic mineral or mineral-bearing substance, rock, earth, clay, sand or gravel.

9. According to the OHSA, ***mining plant*** means any roasting or smelting furnace, concentrator, mill or place used for or in connection with washing, crushing, grinding, sifting, reducing, leaching, roasting, smelting, refining, treating or research on any substance mentioned in the definition of "mine" (see note 8, above

Appendix D: Locally Developed Course

Course Outline for SHSM–Mining, Workplace Preparation – SGM3O

Board: Rainbow District School Board
Prerequisite: none
Discipline/Subject: Science

Course Description

This course provides students with an overview of the mining industry from the geological processes involved in the discovery of an ore body to the extraction and refining of products. Students obtain an understanding of the economics that drive mine development and the environmental impact of mine development. Students gain a better understanding of the mining processes through hands-on activities, presentations by guest speakers, and participation in topic appropriate field trips. Students will also obtain a number of certifications required for the Specialist High Skills Major–Mining.

Curriculum Learning Expectations

A. Mineral Exploration, Geoscience, Discovery, and Mine Development – 22 hours

Overall Expectations

Students will:

- demonstrate an understanding of the formation, characteristics, and uses of the major types of rocks and minerals and identify and describe the stages of the Mine Life Cycle (exploration, development, closure, and reclamation);
- gather geologic data using geo-technologies and tools (e.g., maps, remote sensing imagery, aerial photographs, satellite images, geographic information systems [GIS]) common in geological exploration and mine development;
- explain the steps involved in mine development and their impact (e.g., social, environmental, economic) on local communities.

B. Mining Methods, Mineral Processing, and Extraction Methods – 30 hours

Overall Expectations

Students will:

- identify and describe various surface and underground mining methods and explain how they are selected;
- demonstrate an understanding of the principles of ore processing and metal extraction;
- describe mine layouts for open-pit and underground mining and identify their components;
- explain the processes involved in the mining cycle and how the cycle differs for open-pit and underground mining.

C. Mine Impact on Environment, Economics, and Future Sustainability – 30 hours

Overall Expectations

Students will:

- demonstrate an understanding of mining's impact on the environment, the global economy, and future sustainability and of the steps taken in environmental planning for the different stages of mine operation and mine closure;
- identify environmental protection requirements and processes and the role of economics during all stages of the Mine Life Cycle;
- identify pertinent legislation and practices related to mine rehabilitation and mine closure, and demonstrate an understanding of ethics and social responsibility in the business of mining.

D. Health and Safety Certifications – 20 hours

Overall Expectations

Students will:

- develop an understanding of health and safety legislation as it relates to mining;
- demonstrate an awareness of safe work habits and the Occupational Health and Safety Act and Regulations;
- identify and acquire a number of certifications pertinent to the mining industry (e.g., Workplace Hazardous Materials Information System [WHMIS]), Fall Protection, General Safety Introduction – Surface Miner and Underground Orientation).

E. Careers and Entrepreneurship – 8 hours

Overall Expectations

Students will:

- identify careers in the mining industry and the education and training each requires;
- develop a venture plan for a mining-related business;
- identify key job skills required to be successful in mining or a mining-related business.

Assessment and Evaluation

Formative assessments provide valuable feedback for students prior to summative achievement of expectations being recorded for reporting purposes.

Term	Final
• 70% • summative only • based on achievement chart categories • all categories weighted 20–35%	• 30% • based on achievement chart categories • towards the end of the course

Program Profile

Program Profile: Rainbow District School Board

Name of Initiative	**SHSM–Mining**
Brief description	This program invites students to consider pursuing careers in mineral exploration, mine development, and mineral processing and extraction methods as well as environmental and entrepreneurial opportunities available in the industry. Students learn about the technologies and the tools used in the industry. For example, they manipulate equipment such as surveying equipment and the automated model scoop tram, and have hands-on experience with 3-D modelling software used to visualize mine data.
Number of students	54
Board	**Rainbow District School Board** 69 Young St Sudbury ON P3E 3G5
Board contacts	Name: Theresa Kelly Title: Student Success Leader Phone: 705-523-3308 ext. 226 E-mail: kellyt@rainbowschools.ca Name: Sofia Gallagher Title: Coordinator – Science and Technological Education Phone: 705-523-3308 ext. 203 Fax: 705-523-3314 E-mail: gallags@rainbowschools.ca
School 1	**Lockerby Composite School** 1391 Ramsey View Court Sudbury ON P3E 5T4
School contact	Name: Mike Cole Title: Program Leader – Technological Education Phone: 705-522-1750 Fax: 705-522-0658 E-mail: colem@rainbowschools.ca

School 2	**Lively District Secondary School** Box 430, 265 Fifth Ave Lively ON P3Y 1M4
School contact	Name: Cairin Nelson Title: Program Leader – Student Services Phone: 705-692-3671 Fax: 705-692-9510 E-mail: nelsonc@rainbowschools.ca
Partners:	
Business/Community	- AST Mining Canada, Inc. - Atlas Copco Group - Bestech - Canadian Institute of Mining, Metallurgy and Petroleum (CIM) - Cementation - Centre for Excellence in Mining Innovation (CEMI) - Companhia Vale do Rio Doce (CVRD)/Inco - DeBeers Canada, Inc. - Dynamic Earth - FNX Mining Co., Inc. - Hatch Engineering - Industrial Accident Prevention Association (IAPA) - McLean Engineering & Marketing Co. - Mining Technologies International (MTI) - Mirarco - NORCAT - Ontario Mining Association (OMA) - Prospectors and Developers Association of Canada – Mining Matters (PDAC) - Sandvik Mining and Construction Canada, Inc. - Sudbury and Manitoulin Partnerships Board - Xstrata - YMCA Employment and Career Services
College	Cambrian College
University	Laurentian University